North Carolina Zoo

Field Conservation and Research Program 2009 and 2010




Saving wildlife around the world and in our own backyard.

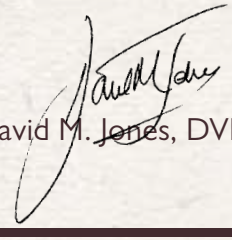
Introduction to the North Carolina Zoo's Field Conservation Program

Year after year the natural world is coming under ever-greater pressure from the activities of a growing human population. Particularly in developing countries, human populations are growing at alarming rates. However, the ecological footprint is as much as 30 times per individual greater in wealthier countries than it is in developing economies. Already, demands from both the developing and wealthier countries have passed the point where the Earth's natural resources can be fully replenished. If we continue on our present pathway, by 2050 humankind will need two Earths to provide the required natural resources.

The rapid consumption of natural resources threatens the survival of many of the species with whom we share our planet. Unsustainable use of natural products like timber, along with environmental pollution and the conversion of natural areas for agriculture, are just a few of the ways in which we are negatively affecting the environment. If we do not change how we interact with the natural world in significant ways, we will soon run out of resources, disrupt the ecosystems in which we live, and push hundreds, if not thousands, of species into extinction. It is therefore imperative that every major biological institution around the world plays a significant role in the maintenance of biodiversity, and in so doing help to ensure the maintenance of healthy ecosystems. No single institution can do this alone; it is only through institutions such as ours making a significant contribution as part of that wider biological and conservation community that we can hope to stabilize the situation for our children and grandchildren.

The field conservation program of the North Carolina Zoo has been growing steadily for the last ten years, but we are currently planning to take a significant leap forward in the range of programs that we run, both regionally and around the world. At present the Zoo and Zoo Society spend approximately 2% of our budgets on conservation of animals and plants in the wild. However, we plan to extend that commitment to at least 5% of our overall budget within the next five years and up to 10% of our total budget within a decade. Apart from some salary costs, virtually all that funding will have to come from private sources, including individuals, foundations, government grants and through partnerships with like-minded organizations.

I hope that, in reading this report and recognizing the steady expansion that we are undertaking with our field conservation program, that you will join us in supporting our efforts for the long-term future.



David M. Jones, DVM

David Jones has been Director of the North Carolina Zoo since 1994. He previously worked for the Zoological Society of London for 25 years, ending up as its CEO. David is a veterinarian and zoologist by training and has served on the boards of numerous international and local conservation organizations. He has consulted on conservation and wildlife matters in over 50 countries and has written over 100 scientific papers. David believes very strongly that stewardship of our natural resources will only succeed if people come to understand the links between their well-being, the economy and the environment.

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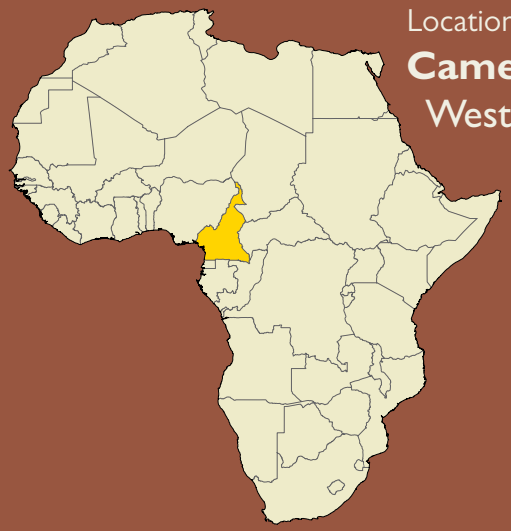
International Projects

The zoo's international conservation projects are focused on Africa, though we have recently begun exploring options for initiating projects in South America. By working internationally, the Field Conservation Program creates links between some of the richest wildlife areas in the world and the diverse range of animals and plants exhibited here at the North Carolina Zoo. Our international fieldwork helps to save the wild cousins of the animals enjoyed by hundreds of thousands of visitors to the zoo every year and provides a direct connection between the people of North Carolina and conservation issues around the world.

Tracking Elephants From Space

Project:
Cameroon Elephant Tracking and Conservation



Location:
Cameroon,
West Africa

Project Leader:
Dr. Mike Loomis,
Chief Veterinarian, North Carolina Zoo

Partners:

World Wildlife Fund, Cameroon

Cameroon Ministry of Forests and Wildlife

Endangered Elephants

Elephant populations across Africa are increasingly threatened by indirect and direct conflicts with humans. As human populations grow they convert elephant habitat into farm land, leaving elephants with less and less suitable area in which to live. Expanding farms also bring people and elephants into more frequent contact. This is dangerous for elephants and people. Elephants are often killed after eating people's crops, and people can be injured when they encounter wild elephants. Elephants are also hunted for their meat and ivory.

Elephants are the largest land animals in the world.

Using Satellites to Track Elephants

The North Carolina Zoo has been involved with the conservation of wild elephants in Africa for over ten years. The Zoo's Chief Veterinarian, Dr. Mike Loomis, works to conserve populations of elephants dwelling in both the forests and savannas of Cameroon, one of the most biodiverse countries in Africa. Dr. Loomis' project, conducted in collaboration with the World Wildlife Fund (WWF), uses sophisticated satellite tracking technology to monitor the movements of elephants at several sites across Cameroon. By placing satellite tracking collars on the elephants, Dr. Loomis and his team can identify habitat that is important for elephants, and use this information for better management of protected areas. The elephant tracking program also allows conservationists to follow migrating elephants and to intervene before they reach farm lands, preventing conflict between people and elephants.

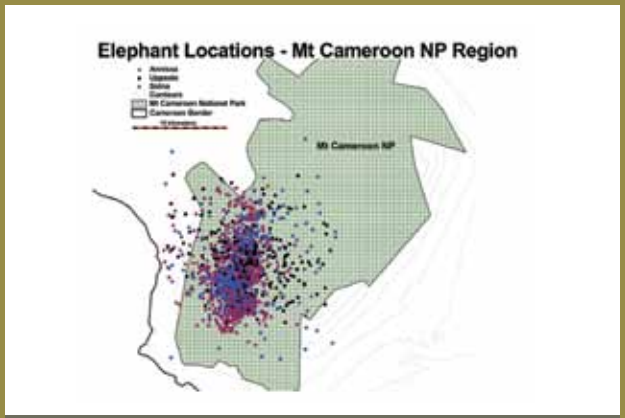
New Sites, New Elephants

2009-2010 was a challenging time for the elephant tracking project. Over the last two years the team has begun working at several new sites in Cameroon that are very important for conservation. While Korup National Park and the Dja Biosphere Reserve are key conservation areas, they have proven tough for collaring elephants. As a result, during 2009 and 2010, Mike and his team were

Dr. Loomis works with the field team to place a tracking collar on an elephant in Cameroon.

Elephants are closely monitored during field anesthesia.

able to deploy only two collars. The first was deployed on Mt. Cameroon, an active volcano just off Cameroon's coast. The second was placed on an elephant in the Dja Biosphere Reserve in southern Cameroon. This was the first elephant collar deployed in this remote rainforest reserve. The Dja Reserve is very important because it is adjacent to several other protected areas which collectively form a large forest block spanning three international borders. We are trying to identify elephant movement corridors across this area for future conservation planning.



Each point on the map represents a location transmitted by a collared elephant.

Even though we only collared two elephants during this period, the information they have provided has been valuable for elephant conservation. Data from the elephant on Mount Cameroon, along with data from two other collars we placed previously, were instrumental in defining the final boundaries of the newly created Mt. Cameroon National Park. In addition, the team has collected data which indicate that the elephant population on Mt. Cameroon my be divided into two separate populations separated by deep alleys which elephants cannot cross.

The Elephant Tracking Project Helps NC Zoo Win an Exhibit Award

In 2009, the Association of Zoos and Aquariums presented a significant achievement award to the NC Zoo for its Watani Grasslands exhibit. The award was based in part on the significant role that information on the elephant tracking project plays in the exhibit. This is a great example of how the NC Zoo's Field Conservation Program feeds back into the zoo itself.

Staff Profile: *Dr. Mike Loomis*

Dr. Mike Loomis is the Chief Veterinarian at the North Carolina Zoo and oversees the division that provides all veterinary medical care for the Zoo's animal collections. Mike graduated from the University of California, Davis College of Veterinary Medicine and received a master's degree in zoology from Indiana University. Mike's career has included work as a veterinarian at both the Los Angeles and San Diego Zoos as well as the NC Zoo. He is past president of the American Association of Zoo Veterinarians and of the American College of Zoological Medicine. He is also an Adjunct Associate Professor of Zoological Medicine at North Carolina State University College of Veterinary Medicine. Mike began work on the Cameroon elephant tracking project in 1998 in order to find ways that humans and elephants could live together more harmoniously.

GPS Technology Helps Save Africa's Most Endangered Ape

Project:
Cross River Gorilla Research and Monitoring

Location:
Nigeria and Cameroon, West Africa

Project Leader:
Dr. Rich Bergl, Curator of Conservation and Research, North Carolina Zoo

Partners:

- Wildlife Conservation Society
- Cross River State Forestry Commission
- Cross River National Park
- Cameroon Ministry of Forests and Wildlife

The Rarest of Rare

The Cross River gorilla is reclusive and rarely seen.

Inhabiting the rugged highlands on the Nigeria-Cameroon border, the Cross River gorilla is the most critically endangered of all the African apes and one of the 25 most endangered primates in the world. This unique type of gorilla (a distinct subspecies) was once thought to be extinct, but was rediscovered by scientists less than 20 years ago. Unfortunately, the survival of these gorillas is threatened by both hunting and habitat loss. It is thought that only about 300 Cross River gorillas are left, fewer than half the number of their mountain gorilla cousins. These remaining gorillas are found only in very remote and mountainous forests where hunters are reluctant to go and where steep slopes prevent farming.

Ruggedized Mobile Computers Give Rangers the Jump on Poachers

One of the major challenges to improving the protection of the Cross River gorilla is making the work of park rangers more effective. To help increase ranger effectiveness, the NC Zoo has developed a data collection system based on rugged handheld computers using global positioning system (GPS) technology and a software package called Cybertracker. With this system, rangers record all signs of gorillas (tracks, nests, sightings, etc.) they encounter in the forest. They also record signs of illegal activity like poaching. The device automatically stores their observation, along with its GPS position.

When the rangers return to base the data they have collected are downloaded to a desktop computer for analysis. The Cybertracker

Field workers now record data directly into hand-held, GPS enabled computers, making data collection more efficient and effective.

software package automatically maps their patrol route, along with relevant observations like gorilla sightings and evidence of illegal activity. Using this information, park managers can better understand where to target ranger patrols and identify key habitat for the gorillas. The system helps protect not only the Cross River gorilla, but all the other wildlife that share the gorillas' forest home as well.

Working Across the Entire Range of the Gorillas and Beyond

The Cross River gorillas have proven difficult to conserve since they are found across a large landscape spanning two different countries. The NC Zoo has therefore put the Cybertracker system in place at multiple sites across the gorillas' range. Between 2009 and 2010 we trained over 200 rangers and researchers in Nigeria and Cameroon to use the Cybertracker devices and provided 25 of the devices themselves. Data ccollected using the devices is already helping make conservation of the gorillas more effective and has been so successful that we have expanded the system to other conservation projects in the region.

Dr. Bergl trains rangers and researchers in Cameroon to use the hand-held computer system.

Mountainous habitat of the Cross River gorilla

Staff Profile: Dr. Rich Bergl

Dr. Rich Bergl, the Curator of Conservation and Research at the North Carolina Zoo, has been conducting conservation-related research in Africa for over ten years. Rich has done fieldwork in Nigeria, Cameroon, Equatorial Guinea, Liberia, Uganda and Kenya and has worked in genetics labs at the Max Planck Institute for Evolutionary Anthropology and New York University. He is an adjunct assistant professor in the Department of Evolutionary Anthropology at Duke University and at the North Carolina State College of Veterinary Medicine. In 2010 was named a Fellow at the Wildlife Conservation Society. In addition to his work on animal populations in the wild, Rich oversees research conducted at the NC Zoo.

A New Subspecies Of Chimpanzee Under Threat

Project:
Chimpanzee Action Plan

Location:
Nigeria and Cameroon,
West Africa

Project Leader:
Dr. Bethan Morgan,
Zoological Society of San Diego

Partners:

- Zoological Society of San Diego
- Wildlife Conservation Society
- SUNY-Albany

A New Subspecies of Chimpanzee

Like its cousin the Cross River gorilla, the Nigeria-Cameroon chimpanzee is highly endangered. As with the Cross River gorilla, these chimpanzees have been significantly affected by hunting and deforestation. This rarest of chimpanzee subspecies was only recently identified as different from other chimpanzee populations. In part because of this recent discovery, these chimpanzees have been understudied. Little is known of their distribution, behavior and habitat requirements. Even the number of chimpanzees remaining is unknown.

Developing a Conservation Action Plan

Like with any difficult task, achieving meaningful conservation of the Nigeria-Cameroon chimpanzee has been made more complicated by the lack of a clear and defined plan. In order to address the problem, a number of organizations, including the North Carolina Zoo, came together to organize a series of meetings and create a comprehensive conservation action plan for these chimpanzees. Under the auspices of the International Union for the Conservation of Nature, these meetings brought together key researchers, government officials, wildlife managers and conservationists share information about these chimpanzees and to develop a framework for their conservation. These meetings were the first-ever gathering of all the experts on this chimpanzee subspecies. Attendees at the meetings presented data on chimpanzee distribution, genetics, behavior and conservation work to date.

The Nigeria-Cameroon chimpanzee is the most endangered chimpanzee subspecies.

Conservationists analyze and discuss data at the action planning workshop.

Making Maps to Save Chimpanzees

One of the major challenges in planning for the conservation of these chimpanzees is the lack of a comprehensive understanding of their distribution. This is complicated by the fact that few good maps exist of the chimpanzees' range. At the action planning workshop, North Carolina Zoo staff collected all the available records of chimpanzee presence from meeting attendees. We added these to a computer mapping database created specially for the chimpanzee action plan, and used the combined data to create a series of digital maps. These maps were used at the meetings to aid discussion and highlight conservation needs. The map database was also used to create maps of the priority chimpanzee conservation sites identified at the meetings. These maps will soon be published in the final action plan and circulated to conservationists in Nigeria, Cameroon and around the world.

Chimpanzees rescued from poachers sometimes end up at rehabilitation centers, like this one in Nigeria.

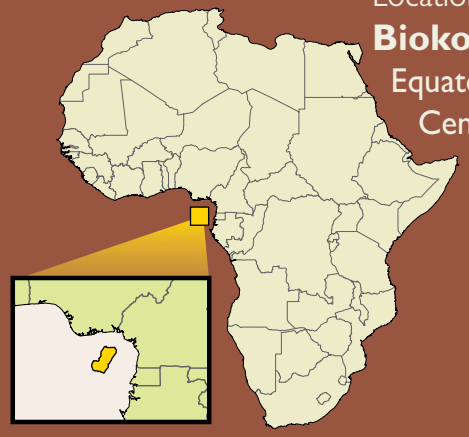
Researchers, conservationists and government officials contributed to the action plan.

Partner Profile: *Dr. Bethan Morgan*

Dr. Bethan Morgan is Head of the Central Africa Program at the San Diego Zoo's Institute for Conservation Research. She oversees all aspects of the Institute's activities in Central Africa, with a strong focus on the Gulf of Guinea forests – a biodiversity hotspot with a wealth of understudied and endemic species. She conducts and manages research and conservation activities at three permanently manned research stations in Cameroon's Ebo Forest. Dr Morgan's interests include the ecology and conservation of gorillas, chimpanzees, and a wide variety of monkey species, as well as of forest elephants. She is a member of the IUCN Primate Specialist Group (Section for Great Apes), and is an Honorary Research Fellow in the Department of Psychology at the University of Stirling, Scotland, and for the Zoological Society of San Diego.

Working To Save The Unique Primates Of A Tropical Island Paradise

Project:
The Endangered Monkeys of Bioko



Location:
Bioko Island,
Equatorial Guinea,
Central Africa

Project Leader:
Dr. Gail Hearn, Drexel University

Partners:
- Bioko Biodiversity Preservation Project
- Drexel University

An Island Hotspot of Biodiversity

Bioko, part of the country of Equatorial Guinea, is a large volcanic island just off the coast of Cameroon. Since it has been separated from the mainland for thousands of years, Bioko is home to a unique and diverse array of plants and animals. The monkeys of Bioko are particularly unique. Bioko's forests contain nine different species of primates, including the impressive drill (a rainforest-dwelling monkey similar to a baboon), the leaf-eating colobus monkeys (two species, red and black), and the highly endangered Pruess's monkey (found only at high altitudes). The large number of unique primates and other species on the island, in combination with relatively low levels of human disturbance, make Bioko an important area for conservation in West Africa.

A red colobus monkey, one of Bioko's unique primates

The rugged terrain of Bioko Island

Monitoring the Bushmeat Market and Wildlife Populations

Though conservation threats on Bioko are less than in many other parts of Africa, growing demand for meat from the forest is putting greater and greater pressure on the island's wildlife. Much of the wildlife research and conservation work currently being done on Bioko is carried out by the Bioko Biodiversity Preservation Project (BBPP; *bioko.org*), a collaboration between Drexel University in Philadelphia and the National University of Equatorial Guinea. Dr. Gail Hearn of Drexel University leads the project and has been involved with research and conservation on Bioko since the early 1990s. Dr. Hearn and BBPP engage in a variety of activities,

Red-eared monkeys are frequently encountered in the forest.

including regular wildlife monitoring in the island's Southern Highlands Reserve, operation of a wildlife research and training center, and surveillance of the island's main bushmeat market. In 2009, the NC Zoo began a partnership with BBPP and Dr. Hearn to help protect Bioko's unique animals.

Using Cybertracker Devices on Bioko

In order to increase the efficiency of data collection on Bioko, the field team implemented a Cybertracker-based data collection system developed by the NC Zoo. Cybertracker is a software package designed to allow easy collection and management of biological data. All data collected are also stored with GPS coordinates to allow easy mapping of observations made in the field. Using the software, Dr. Hearn and her collaborators will be able to easily analyze and map the data they collect in order to better study and conserve Bioko's unique wildlife.

Collecting data helps us better understand the island's wildlife, and how best to preserve it.

Partner Profile: *Dr. Gail Hearn*

Dr. Gail Hearn is a biology professor at Drexel University and the founder of the Bioko Biodiversity Protection Program, a conservation project dedicated to preserving the wildlife and natural habitats of Bioko Island. Bioko Island is located in Africa's Gulf of Guinea; it is remarkable for its rare and endangered wildlife, including seven species of monkeys and four species of nesting sea turtles. Dr. Hearn has been a leader in successfully blending traditional academic research with applied conservation action. Her project has partnered with the local university to deploy wildlife patrols and establish the only field research station in Equatorial Guinea.

Training Conservation Staff in Nigeria's Premiere Wildlife Reserve

Project:
Protection of Nigeria's Yankari Game Reserve

Location:
Yankari Game Reserve,
Nigeria,
West Africa

Project Leaders:
Andrew Dunn, Director,
WIldlfie Conservation Society-Nigeria

Stephen Haruna,
General Manager, Yankari Game Reserve

Dr. Rich Bergl, Curator of Conservation and Research, North Carolina Zoo

Partners:
Wildlfie Conservation Society-Nigeria

Yankari Game Reserve

Nigeria's Premiere Protected Area

Situated in northeastern Nigeria, Yankari Game Reserve was established in 1962. The beauty and the diverse wildlife populations of Yankari Game Reserve make it the most popular reserve in Nigeria. Yankari is the best place in Nigeria to see elephants, lions, buffalo and antelope. Because of its popularity, the park plays a crucial role in the development and promotion of tourism and eco-tourism in Nigeria. It is also home to the largest population of elephants in the country.

Even elephants with small tusks are targeted by poachers.

Ranger Training in Yankari

Though Yankari is one of the keystone protected areas for the future of Nigeria's wildlife, its rangers are poorly paid and equipped. They often lack the skills and tools necessary to properly protect the reserve's wildlife. The North Carolina Zoo, along with project partner The Wildlife Conservation Society, initiated a program in 2009 to provide training and support for the ranger program at Yankari. One component of the training we have provided is teaching rangers wildlife monitoring skills and the use of Cybertracker-enabled GPS units. These devices (which we origainally developed for monitoring gorillas) allow the easy and systematic collection of biological data and integrate these data with GPS information. The system is designed to be used by people with little or no computer knowledge, though it can still be a challenge when the rangers are not familiar with electronic equipment.

Using the Cybertracker system will allow Yankari's managers to better understand Yankari's elephant population, where human activities are concentrated, and which areas are receiving the most protection attention from rangers. All this will help to better preserve the reserve's animal populations.

Rangers collect data with a Cybertracker device.

One of Yankari's elephant herds seen from the air during the aerial survey

Counting Yankari's Elephants from the Air

The most important measure of whether our efforts to conserve wildlife at Yankari are effective is the number of animals in the reserve. To better understand the Yankari's elephant population, the North Carolina Zoo and its partners in Nigeria undertook an aerial survey of the reserve. Methodically flying over the reserve in a small plane allowed us to assess wildlife populations and also identify areas were iillegal activities, such as cattle grazing, were occurring. The data from the aerial census will help us track changes in elephant and other wildlife populations over time.

Partner Profiles:
Stephen Haruna and Andrew Dunn

Stephen Haruna Haruna has served at many of Nigeria's of state and federal conservation agencies and has over 36 years of experience in the field of conservation and wildlife management. Haruna has worked at many of Nigeria's protected areas, including Lame Burra Game Reserve, Yankari Game Reserve, Old Oyo National Park, and Okomu National Park. He was Director of Okomu National Park from 2003-2005 and of Cross River National Park from 2006-2007.

Andrew Dunn has worked for the Wildlife Conservation Society in Nigeria since 2004 and has been working on biological survey and conservation projects in Africa since 1989. He has special expertise in large mammal monitoring and park planning. He is currently assisting the Nigeria National Parks Service with the production of a management plan for Cross River National Park.

International Projects:
Central and West Africa

Conserving One of the World's Most Unusual Primates

Project:
Bonobo & Congo Biodiversity Initiative

Location:
Salonga National Park, Democratic Republic of Congo

Project Leader:
Dr. Gay Reinartz

Partners:

Zoological Society of Milwaukee

Ape TAG

What is a Bonobo?

The bonobo is a species of great ape that is closely related to the chimpanzee and is sometimes referred to as the pygmy chimpanzee. Along with the common chimpanzee, the bonobo is the closest living relative to humans. The bonobo is endangered and is found in the wild only in the Democratic Republic of the Congo. The bonobo population is believed to have declined sharply in the last thirty years. The NC Zoo is helping conserve bonobos by supporting the Bonobo and Congo Biodiversity Initiative (BCBI) through the AZA Ape TAG (see sidebar at right).

An Action Plan for Bonobos at Salonga

The Bonobo and Congo Biodiversity Initiative, now in its 14th year, began as a direct outgrowth of the AZA's bonobo Species Survival Plan. The species' action plan called for surveys in unstudied sites across the bonobo's range. Salonga was identified as a priority survey site, an important conservation site, and the only national park potentially harboring the bonobo.

Bonobos are closely related to chimpanzees, but have a number of behavioral and physical differences.

A Multi-Faceted Approach

Initial surveys discovered five bonobo-rich sites and demonstrated that bonobo distribution was influenced by forest type and hunting. We also found that the greatest threat to the bonobo and to Salonga was poaching. The park guards lacked salaries, rations, basic field equipment, weapons, and training to combat heavily armed poachers. The discovered bonobo sites clearly needed protection. Thus, BCBI evolved into a multidisciplinary program that aims to meet the formidable challenges posed by working in one of world's most beautiful, yet most impoverished, countries.

Today BCBI elements include:

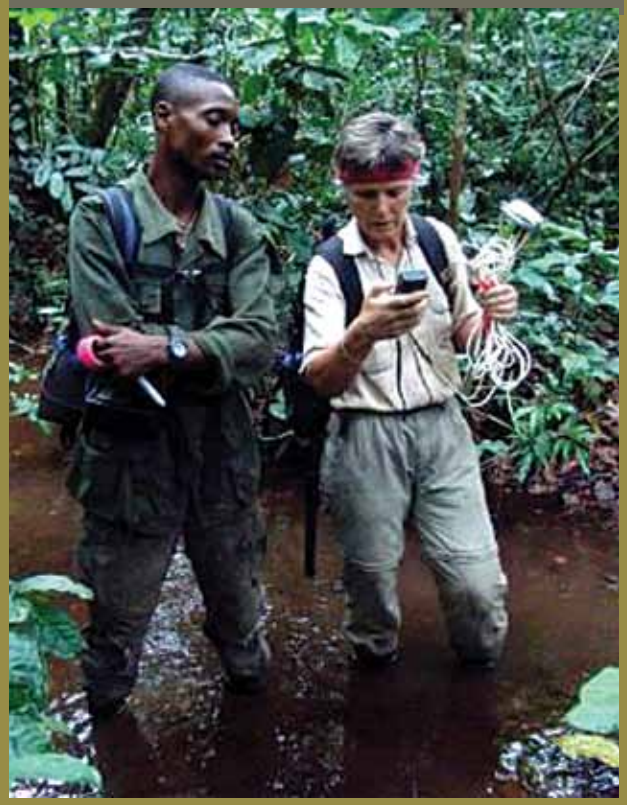
- bonobo ecological research and population monitoring,
- park support and guard training,
- community empowerment.

Progress in the Congo

Based at the Etate research station, BCBI studies the ecological and human factors affecting bonobo distribution. Surveys help researchers target important conservation areas, detect poaching hotspots, and understand which habitats are most likely to harbor bonobo populations. Surveys also provide the basis for planning guard surveillance routes. The Etate guards are trained and provided with the equipment necessary to navigate through vast, uncharted forest. In turn, they provide protection to Etate's approximately 500 bonobos. Likewise, support from the Salonga communities is integral to successful park management. Local villagers lack farming skills, education, and opportunity to improve their lives. By supporting a farming cooperative and agricultural training, assisting primary school teachers, and offering an adult literacy program, BCBI provides means for self-improvement. BCBI has collected critical baseline data on bonobo populations, trained guards who perform more effective patrols, and provided local villagers with economic alternatives to hunting.

BCBI helps remove snares set by poachers from the forest.

Project Leader Dr. Gay Reinartz in the field with one of Salonga's rangers.



Partner Profile:
Ape TAG Conservation Initiative

The Association of Zoos and Aquariums (AZA), the organization that accredits North American zoos, has in recent years been increasing its support of animal conservation in the wild. One new initiaitive is the Ape Taxonomic Advisory Group (Ape TAG) Conservation Fund. This fund was created to increase zoo support of wild ape populations. The initiative does this by creating a collective conservation fund specific to apes and supported by AZA institutions. The proceeds of the fund are used to provide multi-year support to ape conservation projects. Almost 40 institutions have joined the Initiative, committing approximately $300,000 over the next three years. During the inaugural cycle, forty applications were received and reviewed. Eight projects were selected to receive support: one for each of the great ape species and two for gibbons/siamangs. Each of these eight projects will receive $50,000 spread over the next three years. Selected projects include a range of conservation activities, from basic monitoring and protection to law enforcement to ecotourism to veterinary and disease monitoring.

Helping Develop The Next Generation Of Conservation Leaders In Uganda

Project:
Uganda and North Carolina International Teaching for the Environment (UNITE)

Location:
Uganda,
East Africa

Project Leaders:
John Tinka and Michelle Slavin,
NC Zoo UNITE Program

Partners:

- The Kasisii Project
- The Jane Goodall Institute
- Nature for Kids

Promoting Conservation by Helping Schools

The North Carolina Zoo's UNITE conservation education and teacher training project in Uganda has been operating in the villages around Kibale National Park for ten years. Kibale National Park is a world-famous reserve and home to many unique and endangered animal and plantspecies. UNITE provides teachers with training and materials that allow them to effectively convey conservation messages to their students. UNITE trains teachers in student-centered teaching methods, basic environmental knowledge and environmental activities and games that can be integrated into their classrooms. Since its inception, UNITE has promoted innovative ways to teach rural communities about conservation and the environment. By helping educate young people about environmental issues and giving them the skills to make the right decisions, we are helping to ensure the future of one of Africa's most important national parks.

Out of the Classroom and into the Forest

One of UNITE's newest initiatives is providing field trips to natural areas for students in rural schools. Although these children live next to one of Africa's most-visited national parks, most have never seen the park and many have rarely been out of their villages. Field trips take students to places like Kibale National Park (where they learn about its rich biodiversity and the need for protection of this unique ecosystem), a wetland sanctuary (where they get the chance to learn about ecosystem services and see wildlife), and a botanical garden (where they study the medicinal properties of plants and herbs). Exposing students to the natural wonders around them

NC Zoo's Michelle Slavin works with teachers in rural Uganda.

UNITE gives rural school children a chance to visit and learn about the rainforest.

and educating them about the interdependence of all living things will promote the conservation of wildlife and wild spaces. UNITE also works with staff at each of these natural areas, providing professional development that offers teaching strategies and inquiry-based learning techniques geared to enhance the experience of visiting school children. Close to 1,000 students participate in the field trips each year.

Movies for Conservation

Films can be a powerful way to convey environmental messages. In 2010 UNITE partnered with Nature for Kids (a Dutch organization that produces child-focused short movies about environmental issues) to translate four films and associated educational materials into Rutooro, the local language of our Ugandan students. Screenings of the films have been conducted in each of the UNITE communities. For many of the students, these were the first movies they had ever seen. Students and teachers have responded enthusiastically and are learning how their actions can protect the natural resources upon which they depend. After seeing the films, many students spontaneously organized environmentally-friendly activities such as village clean-ups.

Uganda's First Earth Day

In a monumental accomplishment, UNITE organized Uganda's first Earth Day celebration in 2010. Hosted at Bigodi Primary School, over 1500 people attended the event. Guests were treated to environmental songs, dances, poems and plays presented by students and local dance and drama groups. Participants enjoyed walks in the Bigodi Wetland Sanctuary, nature movies, tree planting, and demonstrations of fuel-efficient stove building, wind energy, and solar oven cooking.

Professor Eugene Rugamayo, a guest of honor at Uganda's first Earth Day, plants a seedling with two local children.

Staff Profiles:
John Tinka & Michelle Slavin

John Tinka was born in the village of Bigodi, near Kibale National Park, Uganda and has a long history of working to strengthen his community. He is a founding member of KAFRED, a successful community organization that promotes the develoment of Bigodi. He worked elsewhere in Uganda to promote cultural sites for tourism. Tinka has coordinated UNITE's activities since 2004.

A native of Washington state, Michelle Slavin holds master's degrees in both International Affairs and Sustainable Development. Michelle served in the Peace Corps in the Phillipines and taught environmental education to young people there. Prior to working for UNITE, Michelle worked as a Program Manager for Science Education Reform at the Smithsonian's National Science Resource Center. Michelle is based in Uganda and leads UNITE's teacher-training activities.

Conserving Uganda's Plant Life

Project:
Tooro Botanical Garden Development

Location:
Uganda,
East Africa

Project Leader:
Gin Wall,
Curator of Horticulture,
North Carolina Zoo

Partners:

- Tooro Botanical Garden
- Mountains of the Moon University
- Atlanta Botanical Garden
- Botanical Garden Conservation International
- Montgomery Botanical Garden
- Smith College

A Place Like No Other

The Albertine Rift is a deep valley between some of the highest mountains in Africa. It covers areas in Uganda, Rwanda, Democratic Republic of Congo, Burundi and Tanzania. Approximately 5,800 species of plants have been recorded in the Rift, and many of these plants are found nowhere else. The number of plant species found there is the result of the large number of different habitats in the region, from high mountain ice fields, volcanoes and hot springs, through cloud forest and savanna, down to lowland forests and deep lakes. Like much of the wildlife of the Rift, many of the plant species are also endangered.

TBG supervisor George Bwambale with a rare African cycad rescued from a dam construction project.

Botanical Garden Development

Tooro Botanical Garden's (TBG) work is significant because of the importance of the Albertine Rift as a genetic hotspot of biodiversity. TBG is assisting with the implementation of practices that best fit botanical gardens around the world. Understanding and documenting plant diversity and working with herbaria and TBG living collections contributes to and supports the development of a working list of known plant species. After understanding what is known, conserving plant diversity by supporting the capacity of Tooro Botanical Gardens through improved staff resources, knowledge, funds and materials will help conserve biologically important areas and rare species in the country of origin. Ongoing developments include improving the capacity of the garden to process plants for sale to improve sustainable income, and to provide a suitable structure that houses the garden's records, botanical herbarium specimens and staff offices.

Native Trees and Healing Plants

Work on TBG's living plant collections centers around Ugandan indigenous trees and medicinal plants. TBG field assistant Chris Kaija visits important natural areas in and around Kibale National Park, and other important natural areas in the Albertine Rift, to document plants of significance and to collect seeds, wildings and cuttings of these plants of known provenance, for *ex situ* conservation at the gardens.

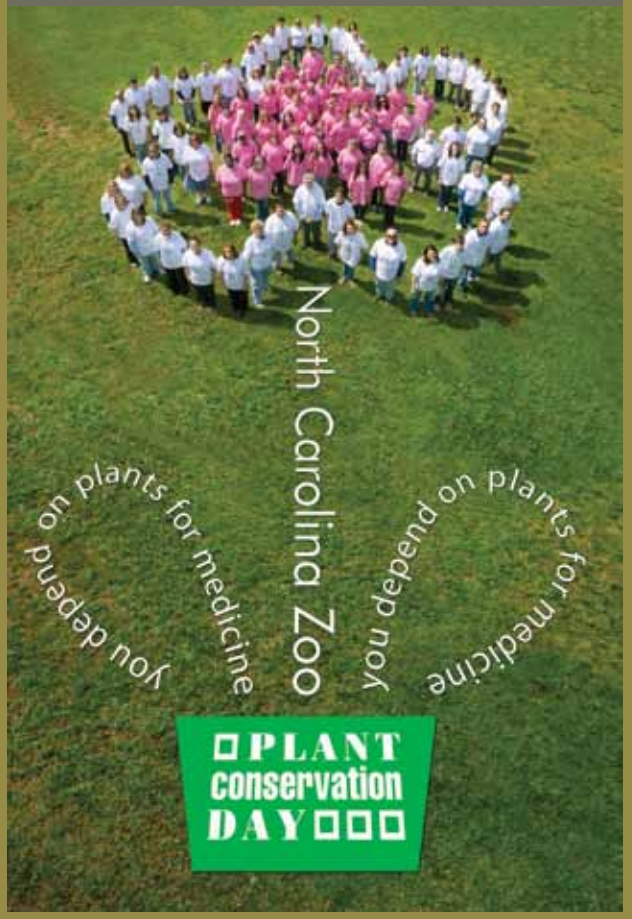
NC Zoo helped to construct new facilities at Tooro Botanical Garden, including this office, herbarium and work facility.

Many plants found in the forests of Uganda have medicinal properties. These range from treatments for malaria to cures for upset stomachs. One species of importance was exported to the North Carolina Zoo, and is now being used at the Kitera Forest Chimp exhibit during the summer as a decorative plant.

Raising Funds For Continued Success

One of the key roles for the North Carolina Zoo's international plant conservation program is fundraising. Fundraising efforts by the Tooro Botanical Gardens in Uganda and through partnerships with the North Carolina Zoo and other North American institutions exceeded targeted goals in 2009. In an effort to blend both conservation and fundraising, the first Plant Conservation Day Sky Art event was held in 2009. Proceeds from the event were used to improve the communication capacity at the garden, including the purchase of equipment such as computers and GPS units. Through a grant from the Association of Zoological Horticulture, the North Carolina Zoo was able to help Tooro Botanical Garden conduct research on medicinal plants, provide supplies for better record keeping, improve the herbarium started at the garden in 2007 and extend the employment of trained and experienced field assistants working with the garden's living plant collections.

NC Zoo Sky Art 2009



Staff Profile: *Gin Wall*

As the Curator of Horticulture at the North Carolina Zoo, Gin Wall is responsible for the care and management of all the zoo's plant collections. One of the original founding members of the Association of Zoo Horticulture (AZH), she has been a stalwart defender of zoological horticulture as well as a leader in conservation on an international scale since she started in this industry over 30 years ago. For her work, Gin has received many individual awards, including the 2009 Chuck Rogers Conservation Award. Additionally, under her administration, the Horticulture Division has received numerous awards for zoo landscaping, environmental stewardship and conservation programs. Gin has a strong interest in plant conservation and her goal is to create connections between Zoo audiences, the Zoo's plant collections and the wild habitats where they are found.

Preventing Serious Injuries To Wild Chimpanzees

Project:
Chimpanzee Research and Conservation in Kibale National Park

Location:
Uganda,
East Africa

Project Leader:
Dr. John Mitani
University of Michigan

Partner:
University of Michigan

An Important Site for Chimps

Ngogo, in Uganda's Kibale National Park, has been the site of long-term research on the behavior of chimpanzees. With over 150 chimpanzees, the Ngogo chimpanzee community is the largest thus far described in the wild. Research there has provided new insights into several aspects of chimpanzee behavior, and continues to generate widespread publicity.

The Problem of Wildlife Snares

Enclosed entirely by forest on all sides, Ngogo has not been the site of frequent poaching activity historically. This situation has changed recently, however, as signs of poachers and the number of chimpanzees with wounds from snares has increased dramatically. Chimpanzees at Ngogo inadvertently get caught in snares snares set by poachers seeking bushmeat in the park. While chimpanzees are not the target of snares, snared chimpanzees nonetheless suffer deleterious consequences. Snared individuals are easy targets of aggressive attacks by chimps from other communities. Further, even if they escape, injured chimps can suffer due to decreased agility and locomotor skills, and may have difficulty caring for young offspring. While chimpanzees are a critically endangered species, they are not the only animals affected by snares at Ngogo; essentially all terrestrial animals are threatened.

Snare Removal

Beginning in 2010, the NC Zoo supported regular patrols to remove snares that threaten the health and welfare of the Ngogo chimpanzees. Patrol teams are led by Mr. James Tibisimwa, a long-time employee with the Ngogo Chimpanzee project. Mr. Tibisimwa has implemented this project by leading patrols and by training two other individuals to learn the forest and to find snares and signs of poachers. These data will allow project leaders to determine if poachers are targeting any specific areas. Subsequent patrols will focus on these areas and will lead to better management decisions in the park.

Chimpanzees can get caught in snares meant for other animals.

Grey Crowned Crane Trade Investigation And Mitigation

Project:
International Crane Trade

Location:
Uganda,
East Africa

Project Leaders:
Ken Reininger
General Curator, NC Zoo

Jimmy Muheebwa,
International Crane Foundation

Partners:

International Crane Foundation

Endangered Wildlife Trust of South Africa

Rapid Decline

Since 1985, the East African Grey Crowned Crane population has declined from over 90,000 to as few as 43,000 individuals. Grey Crowned Cranes are highly valued as ornamental birds for private collections throughout the world. As a result, trade is now one one of the key threats to Grey Crowned Cranes. The African Crane Trade Project was initiated under African Cranes, Wetlands and Communities, a partnership between the International Crane Foundation and Endangered Wildlife Trust in 2006. The project aims to better understand the African crane trade and to develop measures to minimize its impact on wild populations.

Crowned Crane, National Bird of Uganda

Trade Case Study in Uganda

Four preliminary *in situ* case studies were conducted in localized areas in Kenya, South Africa, Uganda and Tanzania to determine whether or not the removal of cranes from the wild poses a significant threat to the species and whether mitigation measures are required. In Uganda, local community members gathered information on any cranes removed from the wild and, through questionnaires and interviews, gained broad understanding of the crane trade in their area. Information gathered indicates that a large number of cranes were caught and sold illegally; however, cranes were also used for traditional purposes.

Study Outcomes

In part as a result of this work, the Grey Crowned Crane has been uplisted in 2010 to Vulnerable on the IUCN Red List because of habitat loss and the illegal removal of birds and eggs from the wild. Further clarification of the rate of decline across its range may result in a further uplisting to Endangered. In addition, partner Jimmy Muheebwa recently was the recipient of the prestigious Whitley Fund for Nature Award, which will fund continued work on Crowned Crane conservation in Uganda.

Expanding Our Field Conservation Work Into The Rain Forests Of South America

Project:

Suriname Wildlife Conservation Pilot Study

Location:
Suriname,
South America

Project Leader:
Ken Reininger,
General Curator,
North Carolina Zoo

Partner:
Riverbanks Zoo

Intact Amazon Rainforest

Suriname is located on the northern coast of South America. It is roughly the size of Florida with a human population of only about 500,000 people. Because of this, Suriname is home to the largest area of undisturbed tropical rainforest in the world. In 2009, staff from the North Carolina Zoo partnered with like-minded staff at the Riverbanks Zoo in Columbia, South Carolina to investigate ways we could help conserve this important haven for biodiversity.

Investigating Potential Projects

In February 2009 we began to assess the potential for getting involved with nature conservation in Suriname. Several projects emerged with a foothold in the area. Among these are assisting in the monitoring of sea turtle nesting beaches and protecting wading birds, like the striking scarlet ibis. Our first contribution will be to purchase a new boat to patrol turtle nesting beaches on the coast. While this is a small start, we plan to increase our involvement in Suriname over time.

The brilliantly colored scarlet ibis

Staff Profile:
Ken Reininger

As head of the Animal Division, Ken Reininger oversees animal care, acquisition and exhibits at the zoo. In his 30-plus years as a zoo professional, Ken has had significant involvement with several bird conservation and science programs for the Association of Zoos and Aquariums (AZA) as well as serving on the association's Animal Welfare and Wildlife Conservation Management committees. Ken's professional and research interests include zoo collections sustainability, survival rate comparisons of wild and captive birds, the impact of fungal spores on bird health, seabird nutrition, and the evaluation of well-being in captive animals.

Regional Projects

The zoo's regional conservation programs are focused in our home state of North Carolina. By working in a number of natural areas around the state, we support research on, and conservation of, North Carolina's impressive array of plant and animal species. Our state-based activities vary widely, ranging from field surveys of threatened salamanders to management of unique plant communities. We work with a number of public, private and non-profit partners across the state, including the North Carolina Wildlife Resources Commission, the North Carolina Natural Heritage Program, and the Piedmont Land Conservancy. Our efforts in North Carolina serve to demonstrate that wildlife conservation is not something that only happens on the other side of the world, but in our own backyard as well.





SAVE OUR SNOT OTTERS!

Project:

Hellbender Salamander Conservation and Research

Location:

The mountains of western North Carolina

Project Leader:

John Groves,
Curator of Amphibians and Reptiles,
North Carolina Zoo

Lori Williams,
North Carolina Wildlife Resources Commission

Partners:

- North Carolina Wildlife Resources Commission
- Western Carolina University
- University of North Carolina-Asheville
- North Carolina Natural Heritage Program
- North Carolina State Parks

The Biggest Salamander in North America

Hellbenders, affectionately known as "snot otters" due to their slimy skin secretions, are one of North America's largest salamander species. This species occurs in three different places in the United States: the southern Ozark Mountains, the northern Ozark Mountains, and the Appalachian Mountains. Hellbenders are found in fast-moving mountain streams, usually underneath rocks or boulders. As is the case with amphibians globally, many hellbender populations are experiencing steep declines, some up to 77%. Despite these declines, little is known about hellbender populations in the wild, and the Appalachian hellbenders are particularly understudied.

Zoo Staff Search North Carolina's Mountain Streams

Over the last four years the the North Carolina Zoo — in partnership with the North Carolina Wildlife Resources Commission, other state and federal agencies, and several universities — has been surveying and monitoring mountain streams in the state for hellbender populations. Survey teams spend long hours wading, snorkeling and swimming in chilly mountain waters looking under rocks for this elusive study subject.

Hellbender, North America's largest salamander

Information about hellebenders and their habitat is recorded to better understand what is happening with populations of these amphibians in the mountains of North Carolina.

Four of the five river systems in North Carolina where hellbenders are known to occur have been surveyed. During these surveys, hellbenders were found at most of the sites investigated. However, sites in the far west of the state tend to contain hellbenders more frequently, and in larger numbers, than locations further east. Though this finding needs additional confirmation,

Swift moving streams are the are the preferred habitat of hellbenders.

it suggests that higher levels of development along rivers in the eastern mountains are negatively affecting hellbenders. Future research will look more closely at this relationship and will try to identify specific factors that influence the presence of these amphibians.

Better Protection For Hellbender Habitat

As a result of our hellbender research, the North Carolina Division of Water Quality upgraded one river in the French Broad Drainage system to the status of Outstanding Resource Water (ORW). This designation will allow more protection of this river and its resident hellbenders when future construction or development permits are requested. In 2009 and and 2010 the project continued collecting data on hellbenders in the mountains of North Carolina, working to create a more accurate picture of the status of these amphibians.

Field team members sometimes have to don wetsuits and snorkels to find hellbenders.

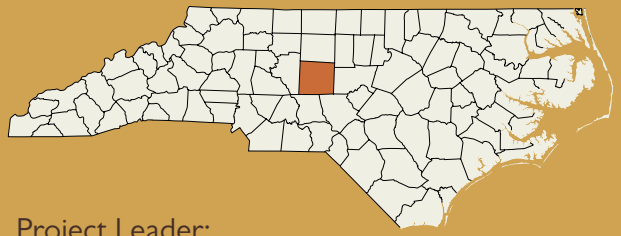
Staff Profile: *John Groves*

North Carolina Zoo Curator of Amphibians and Reptiles John Groves has worked in the zoo industry for more than 45 years. In addition to his zoo work, John has been active in field-based conservation biology throughout most of his career. His work includes research and conservation projects in South and Central America, Mexico, Hawaii and the Marianas Islands, as well as in various parts of the United States. Much of his research has focused on the natural history, behavior and conservation needs of amphibians, reptiles and birds. John's research programs at the NC Zoo include studies of the life history of the Cape Fear Shiner (an endemic North Carolina minnow) and the hellbender. John also supervises monitoring of native wildlife on N.C. Zoo grounds, particularly the park's box turtles and venomous snakes.

A Nature Preserve On Our Doorstep

Project:
Ridges Mountain Natural Area Management

Location:
Randolph County, North Carolina



Project Leader:
North Carolina Zoo,
Horticulture Department

Partners:

Piedmont Land Conservancy

North Carolina Natural Heritage Program

An Important Site for All of North Carolina

Ridges Mountain Nature Preserve is located west of the North Carolina Zoo in Randolph County. The Natural Heritage Inventory of Randolph County lists Ridges Mountain as a site of State significance (i.e. one of the best in the State). Several uncommon natural communities are found on the mountain, including Basic Piedmont Monadnock Forest, Basic Oak-Hickory Forest, Upland Pools and Upland Depression Swamp Forest. The mountain supports several wildlife corridors that provide a link to other Natural Heritage priority areas. Ridges Mountain also provides breeding habitat for wildlife, including forest interior bird species and Central and South American migrants. Unfortunately, the integrity of the Ridges Mountain area has been threatened in recent years by timbering and development, so the NC Zoo has embarked on a variety of activities to protect this important natural area. Since 2000, the zoo has worked with its partners to manage Ridges Mountain for conservation, research, recreational and educational activities.

Grassy hummock sedge grows in an upland depression on Ridges Mountain at the end of April.

Windflower blooming on Ridges Mountain

An Archeological Treasure Chest

Part of the significance of Ridges Mountain is its long history of human occupation, first by Native Americans, and later by early settlers of the Piedmont. With the help of U.S. Forest Service

U.S. Forest Service archeology interns screen excavated soil, sifting for artifacts.

archeologist Joel Hardison, the NC Zoo is assessing archeological and 2010 the project continued collecting data the National Register of Historic Places. In the summer of 2010, an archeological survey of the preserve began with an old home site located on the east slope of the mountain. Future plans include investigating earthen works that probably once supported portable sawmills, along with stacked stone walls at the top of the mountain that might have been part of the fencing for draft horses used in timbering operations.

A Hotspot for Underwing Moths

Ridges Mountain has also become an important destination for researchers interested in the natural world. Dr. Stephen Hall, invertebrate zoologist for the North Carolina Natural Heritage Program, conducted several moth surveys at Ridges Mountain Nature Preserve during 2010.

The tearful underwing moth feeds on hickories.

These surveys are part of a project documenting vertebrate and invertebrate populations throughout the state, and currently focusing on the Uwharrie region. The information collected in this study will improve our understanding of which sites are most important for conservation. Hall is focusing on sampling moths in the genus *Catocala*, commonly called underwing moths. They get this name because, when predators disturb these moths, the flash of the hind-wings as they fly off may serve to startle or distract the predator, at least momentarily. During Hall's recent trip, he captured several species of hickory-feeding underwing moths that were his main target.

New Lands Expand Nature Preserve

In 2010, three tracts of forested land totaling 91 acres were added to the 181-acre Ridges Mountain Nature Preserve. The largest tract of land, 51 acres, includes the rocky northern peak of the mountain. Two smaller tracts added part of the forested eastern flank of the mountain and a portion of the ridgeline to the existing nature preserve. The new lands include the rare Basic Oak-Hickory plant community type, habitat for many animal species, and a wildlife travel corridor that connects Ridges mountain to other natural areas to the north and east.

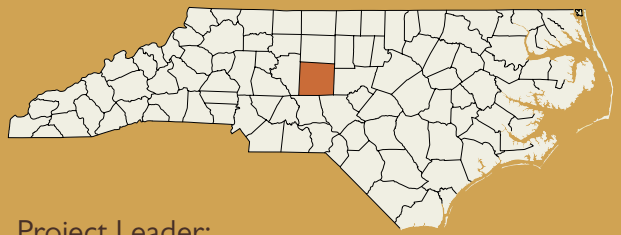
Staff Profile: *Moni Bates*

Moni Bates is the biologist in charge of biological inventories for North Carolina Zoo regional projects. She received her B.S. from Iowa State University in biology, an M.A. in Teaching from the University of North Carolina, and an M.S. in botany from UNC at Greensboro. As a graduate of the Natural Resource Leadership Institute through NC State University, Moni creatively merges her knowledge with other disciplines and provides leadership to create natural areas for plants, animals, and people. Ms. Bates' areas of expertise include botanical inventories, natural area restoration and management, rare plant monitoring design and analysis, plant reproductive biology research, and conservation site planning. Ms. Bates serves on the The Land Trust for Central North Carolina Board of Directors, and is a member of the Association of Southeastern Biologists.

Preserving Natural Areas Across Central North Carolina

Project:
Selma Cornelison Ward Nature Preserve and Arnett Branch Longleaf Pine Forest

Location:
Randolph County, North Carolina



Project Leader:
North Carolina Zoo
Horticulture Department

Partners:
Piedmont Land Conservancy

Uwharrie Conservation Partnership

Adding to a Trail Corridor

Following two and a half years of collaborative work, a new nature preserve has been created

on 323 acres of forested land south of the zoo. This is one of the few remaining large forested areas near the zoo and it connects to zoo lands by way of a 272-acre tract purchased by the Zoo Society in 2008. By acquiring this land the zoo has protected a large area of uninterrupted high-quality mature hardwoods. It is also an important wildlife travel corridor linking forested areas on the NC Zoo property to other wooded tracts. The zoo received $1.5 million in funding granted by the Natural Heritage Trust Fund.

A Place for All to Enjoy

The zoo will manage this area as a nature preserve, with a greenway usable by nature-based recreational audiences. It will also expand existing high school environmental education programs to this natural area. A hiking trail will join the new nature preserve to the zoo, passing through the North Carolina Zoological Society's connecting tract. The zoo will also expand programs to these lands. Management began in Fall 2010, when 50 zoo school students removed more than a ton of trash and scrap metal from an old dumping site on the preserve.

The headwaters of Bachelor Creek flow through the zoo's newest nature preserve.

Volunteers help to clean up the nature preserve.

Saving one of the Piedmont's Last Longleaf Pine Forests

In partnership with the Land Trust for Central North Carolina, the North Carolina Zoo received a grant of $150,000 from the North Carolina Natural Heritage Trust Fund to preserve a portion of the 112-acre Arnett Branch Longleaf Pine Forest. Located in northern Montgomery County (about 15 miles from the zoo), this forest is more than 200 years old and is the last remaining old growth longleaf pine forest stand in the region.

This biologically significant site is located in the heart of the Greater Uwharries region, an area of unique biological diversity, and is adjacent to a corridor of other natural lands in an increasingly fragmented landscape. A conservation-minded private donor has contributed $50,000 to purchase a two-year option agreement to hold the property until complete funding for purchase is found.

Old longleaf pines grow tall and straight in northern Montgomery County.

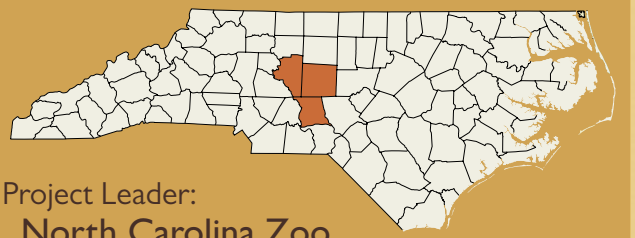
Staff Profile: *Nell Allen*

Nell Allen is the Rare Plant Curator at the North Carolina Zoological Park. Following eight years as the Administrator for Sandhills Area Land Trust in Southern Pines, Nell returned to school and, in 2007, received a Master's Degree in Natural Resources, with an Ecological Restoration Technical Option, from NC State University. Her research focused on Piedmont prairie restoration in North Carolina. She joined the zoo's Horticulture Department in May, 2007

Rescuing Endangered Sunflowers From Expanding Roads

Project:
Schweinitz's Sunflower Recovery

Location:
Randolph, Davidson and Montgomery Counties,
North Carolina



Project Leader:
North Carolina Zoo,
Horticulture Department

Partners:

North Carolina Department of Transportation

Piedmont Land Conservancy

A Brief History

Schweinitz's sunflower was named for Lewis von Schweinitz, an intrepid Moravian botanist who traveled North Carolina's Piedmont in the early 1800s. This late-summer and fall-blooming flower is found in only 12 counties in the North Carolina Piedmont and two counties in South Carolina. This sunflower thrived in the open, grassy Piedmont prairies which were common in the Southeast before European settlement. The tuberous root, similar to that of a Jerusalem artichoke, once provided a food source for Native Americans.

Threatened by Development

The sun-loving Schweinitz's sunflower was probably frequent in open grassy savannas of the North Carolina Piedmont hundreds of years ago, but this species has lost much of its habitat through conversion of land to agriculture and forests. Farming and the lack of frequent fire in the landscape have reduced the once widespread grasslands to small, isolated patches, which are often located along sunny roadsides or power line corridors. As the roads of the Piedmont are upgraded by widening and paving, an unintended side effect is sometimes the destruction of populations of this now endangered plant.

Continued Protection and Recovery

Since 2001, the North Carolina Zoo has been working with other conservation groups to transplant Schweinitz's sunflowers from road widening projects and to manage several recovery sites in Randolph and Davidson Counties. Unfortunately, a combination of dry weather and hungry deer has stunted the growth of some of the most recent sunflower transplants. In 2010, temporary fencing and deer repellent sprays were used to protect some of the young plants. This intervention has allowed the plant to grow and establish, resulting in larger plants and more flowering.

In the summer of 2010, the zoo also helped rescue a number of Georgia asters and transplant them to restoration sites. Like the endangered Schweinitz's sunflower, the Georgia aster mostly lives in the sunny open habitat provided by roadsides and power lines and is threatened by development. Although it is found in the counties of six southeastern states, it grows in only a few places in each one. It is most widespread in Georgia and North Carolina, where it occurs in eight counties in each state. So far, three Georgia aster sites are known in Randolph County.

On-Site Projects

In addition to our work around the world and across North Carolina, the Zoo has active conservation and research programs on site. We monitor wildlife on the zoo's extensive 1,500 acre property, conduct research into the behavior and management of the animals in our care, work with universities across the state to facilitate external research projects, and train students in field and research techniques. So, while the Zoo is a great place to spend the day, it is also a valuable scientific and learning resource.

"Trapping" Wildlife using Cameras

The large NC Zoo property is home to many native wildlife species. Even predators like bobcats can be found in the woods around the zoo.

In 2010 we began placing automated, motion detecting cameras ("camera traps") at strategic points in some of the more wild areas of this land to monitor predators and other wildlife species. This study will document what species are present and give us more insight into how native wildlife uses our land. This information will help us manage the wildlife with which we share the zoo property more effectively.
In a relatively short period of time we have photographed lots of deer and coyotes and even a few bobcats.

Box Turtle Tracking

The NC Zoo has more active baby box turtles than most known localities. Using GPS technology, we are mapping the locations where box turtles have been found at the zoo. Over the long term, this study will allow us to identify preferred habitat, follow yearly and seasonal changes in habitat use, and estimate home ranges. We are collecting extensive data on each located turtle. This is a time-consuming process in the field but, over a period of years, will allow us to compile a detailed description of the local population, including its unique characteristics, needs and factors affecting its sustainability.

Radio-Telemetry of Snakes

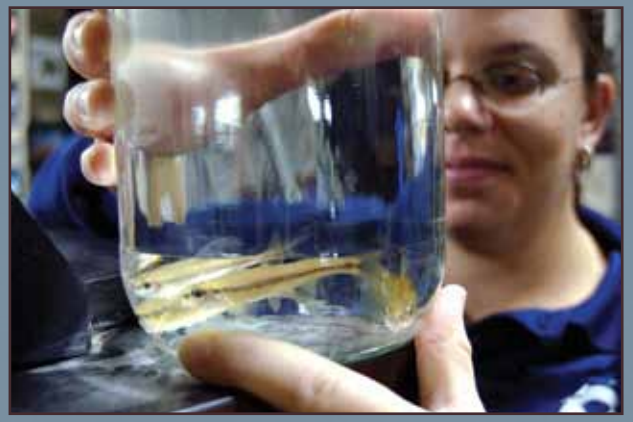
It might be a surprise for some zoo visitors to learn that two vemous snakes, the copperhead and the timber rattlesnake, occur naturally on the NC Zoo site. For several years zoo keepers and veterinary staff have been placing radio transmitters in some of these snakes to monitor their movements and activity patterns. This study helps us learn about the behavior of the snakes and to develop ways to avoid visitor-snake interactions throughout the zoo.

Gorilla Evolutionary History

In collaboration with Dr. Linda Vigilant of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, the North Carolina Zoo is participating in a study of the evolutionary history of gorillas. The zoo is gathering gorilla blood samples from across North America for genetic analysis. The large number of samples that are being collected will allow scientists to better understand how and when gorillas evolved in Africa and how the different subspecies of gorillas are related.

Natural History of the Endangered Cape Fear Shiner

One of the smallest animals in the NC Zoo collection is also one of the most endangered. The Cape Fear Shiner is a small minnow (only two inches long) that is found only in central North Carolina's Cape Fear River and its tributaries. Over the last 100 years, dam construction along the Cape Fear River has disturbed their habitat, leaving few areas where the fish can survive. Only five populations of the Cape Fear shiner remain in the wild. In order to better understand their biology and habitat requirements, the North Carolina Zoo has maintained a study population of this endangered species for over ten years.
This is the only captive population of Cape Fear shiners in the world. Our research in the zoo helps better conserve the few remaining wild populations of this fish.



Red Wolf Breeding and Reintroduction

The red wolf was once common throughout the southeastern United States. However, habitat loss and persecution drove the wolves to extinction in the wild in 1980, with the only surviving wolves living in zoos. Following an intensive captive breeding program, wolves from zoos were released into the wild at the Alligator River National Wildlife Refuge in coastal North Carolina. The wild population has now grown to 26 packs (totaling over 70 wolves) with 11 breeding pairs. The North Carolina Zoo maintains a colony of red wolves as part of the overall red wolf conservation program. Several wolves from the Zoo have been reintroduced to Alligator River and now live in the wild.

Growing Vulnerable Venus Flytraps

The Venus flytrap is a plant that has a naturally small home range, and is only found within about 60 miles of Wilmington, North Carolina. It's very particular about its natural habitat. It likes acidic, low-nutrient bogs and wet savannas, which may be low in nutrients but are sunny and open. Unfortunately, the uniqueness of these plants has made them a target for poaching by plant dealers and collectors. In some cases, whole populations of flytraps have been dug up and taken away. The NC Zoo maintains a colony of Venus flytraps for both conservation and educational purposes. The zoo also maintains a carnivorous plant garden featuring several other insect-eating plants in order to educate visitors and increase their appreciation for these vulnerable plants.

Developing a More Natural Diet for Zoo Gorillas

The North Carolina Zoo is home to gorillas, the world's largest primate. In the wild, gorillas eat large amounts of green vegetables and consume over a hundred different species of plants. In 2008, North Carolina Zoo's gorilla group was placed on a new diet. This was formulated to be heart-healthy (lower starch and higher in fiber) and to also encourage natural behaviors. In 2010, this diet change was expanded into a multi-institutional study including Cleveland Zoo, Toronto Zoo, Woodland Park Zoo and Columbus Zoo and Aquarium. This new diet has increased activity levels in gorillas up to 50-60% of their time (comparable to what is seen in wild gorillas). Across the board the gorillas in the study have also lost weight. This is significant as obesity may be a risk factor for the development of heart disease in gorillas (like in humans). In the next stage of the study we plan to work with our partners to examine risk factors of heart disease in detail and how these may be related to diet.

Treating a Medical Condition in Giraffes with Hay and Leaves

In 2009, the N.C. Zoo, in collaboration with the Chicago Zoological Society, the Wilds and the Oakland Zoo, began a study to determine the prevalence of uroliths (urinary tract stones) in captive giraffes. The disease occurs in many ruminants and can be fatal, especially in males due to the anatomy of their urinary tract. Treatment of uroliths can be difficult, and often involve risky surgery to remove calcified deposits from the bladder or urethra.

Our study looked at whether diet management and promotion of water intake may prevent or deter urolith development. By studying the chemical composition of giraffe urine at multiple zoos, we found that providing a high-fiber diet, including hay and tree cuttings, decreased the risk of animals developing this potentially life-threatening condition.

Planting Trees for Polar Bears

Some scientists predict that in five years the levels of carbon dioxide in the Earth's atmosphere will reach the point of destroying sea ice forever. Sea ice is used by polar bears to find mates, construct maternal dens, give birth to cubs, and as a platform for hunting. As the top predator of the Arctic, the decline of polar bears would affect the entire arctic ecosystem. To help address this problem, the NC Zoo joined the Acres for the Atmosphere program. Acres for the Atmosphere is a joint project of the polar bear conservation organization Polar Bears International (PBI) and the American Association of Zoo Keepers (AAZK). The goal of the program is to plant trees in local communities and help educate the public about the benefits of tree planting to counteract a warming climate. Zoo keepers from the North Carolina Zoo have been planting trees in communities all around the zoo to help keep the world just a little bit cooler for polar bears.

Veterinary Research Effects of Meloxicam Administration on Inflammation in the North American Bullfrog

Amphibians are an important part of the zoo's animal collection but, compared to mammals, the best options for their veterinary care are poorly studied. Vets at the North Carolina Zoo studied the effect that a common anti-inflammatory drug (meloxicam) had on North American Bullfrogs. During the study, an anti-inflammatory drug was administered to the frogs and measurements taken of the frogs' inflammatory response. Frogs receiving the drug had a significantly lower inflammatory response than frogs who did not receive treatment. These results suggest that anti-inflammatory drugs are an effective treatment for amphibians receiving veterinary treatment.

Health Assessments of Free-Ranging Cottonmouth Snakes in North Carolina

The cottonmouth is one of the most widely recognized venomous snakes in the southeastern United States and consequently is displayed as an exhibit animal at many zoos around the country. However, the range of normal blood values (analysis of blood samples is a common tool for determining the health status of zoo animals) for these snakes is not well-known. The zoo's Dr. Ryan Devoe is leading a project to obtain blood samples from wild cottonmouths in order to establish what the blood parameters for healthy snakes should be. These data will make diagnosis and treatment of disease in captive cottonmouths easier and more effective.

Diet Evaluation of North American River Otters

North American river otters are a popular and charismatic species at many zoos. In the wild these otters eat primarily fish, but also consume amphibians, crayfish, small mammals, birds and insects depending upon the region and season. In zoos, the

diet otters receive varies widely, from a combination of fish, shellfish, rodents, fruit, vegetables and chicken to one that mixes several commercially prepared diets. The North Carolina Zoo is currently participating in a study to evaluate the appropriateness of three different diets being fed to North American river otters. The results of the study will allow new diet formulations to be based on precise measurements of digestibility of energy and nutrients. This will help ensure that otters in zoos are receiving the best possible diet.

Puerto Rican Crested Toads

The Puerto Rican Crested Toad is declining precipitously in the wild. As a result, reintroductions of captive-bred tadpoles have been suggested as a way to supplement natural populations. Keeping these amphibians in large enough colonies to produce sufficient numbers of tadpoles presents many challenges; however, the North Carolina Zoo maintains a colony of several hundred of these toads. Zoo veterinarian Dr. Ryan DeVoe is also working with biologists studying these toads in their natural habitat to identify causes of mortality in the wild population.

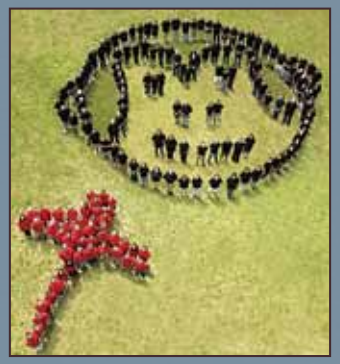
Conservation Fund Raising

Pocket Change for Rainforest Conservation

When visiting the zoo you may have noticed our conservation parking meters. What were once ordinary parking meters have been modified to accept change donations that will go toward habitat preservation. Conservation parking meters make it easy for zoo visitors to help protect wildlife since every penny donated is used to protect rainforest habitat. Conservation parking meters at the NC Zoo and 150 other institutions have collected about four million dollars for rainforest ecosystem protection in eleven countries.

Sky Art

The zoo's horticulture department has for several years taken a fun approach to raising money for its plant conservation projects. The annual sky art event brings volunteers together to form an outline of an image that is then photographed from above. The coordinated use of colorful t-shirts adds to the effect. Each sky art event has a plant theme. In 2010 volunteers formed the outline of a chimpanzee and an aframomum plant.



Bowling for Rhinos

Bowling for Rhinos is a fun way for zoo keepers and other interested people to raise money for rhino conservation. The North Carolina Chapter of the American Association of Zoo Keepers (AAZK) has been involved with Bowling for Rhinos since 1991. Since that time, keepers at the NC Zoo have raised almost $100,000 to help save rhinos. Nationally, AAZK has raised over 3.7 million dollars for rhino conservation. Funds raised through Bowling for Rhinos go directly to conservation projects, conserving the four species of rhino, their habitats, and hundreds of other endangered plants and animals.

Collaborative Research With Other Institutions

Ape Bio-Bank

It is always unfortunate when a much-loved gorilla or chimpanzee at the zoo passes away. However, much in the same way that humans can become organ donors, the NC Zoo is working with Duke University to ensure that animals from the zoo can continue to be useful even after their deaths. Working with Duke and other zoos around the country, we are trying to establish a "bio-bank" to preserve tissues from apes for future study after they die. These materials are extremely rare and valuable for study of a diverse range of topics — from primate behavior and evolution to human health and disease.

Cutting Edge Research on the Intellectual Abilities of Apes

Since 2007 the North Carolina Zoo has supported the research of Duke University's Dr. Brian Hare on the cognitive abilities of chimpanzees and other primates. Dr. Hare and his students study how apes and humans differ in their social problem solving ability and in what ways the differences between human and ape behavior is biologically based. In order to do this, Dr. Hare and his students present the zoo's primates with fun games that test their ability to solve problems. While this research is valuable for the insights it provides into human and ape evolution, it also has implications for better understanding things like autism, conflict between human cultures, and animal welfare.

Bacteria of Primate Digestive Tracts

Graduate student Erin McKenney from NC State University studied the various microorganisms living in the digestive tracts of several primate species. Using fecal samples collected from chimpanzees, gorillas and baboons at the zoo, Erin analyzed the DNA of these microorganisms to look at the links between them and the food types consumed. She found clear differences between animals that are primarily fruit-eaters and animals that eat mostly green, leafy vegetation.

These findings suggest that both the primates and the bacteria in their guts have evolved in response to the foods they preferentially consume.

NC Zoo Birds Help Scientists Gain a Better Understanding of Global Warming

Global warming is predicted to have a pronounced impact on arctic species. In order to better understand the effects of climate change on arctic seabirds, Dr. Alexander Kitaysky of the University of Alaska is developing a new method for determining the age of puffins and other species from blood samples. The NC Zoo is supporting this research by providing samples from seabirds in its collection here at the Zoo, whose age is known. These samples will allow Dr. Kitaysky to validate his new technique for application to wild populations of these arctic animals.

Research and Professional Training

Helping Train African Scientists

While the NC Zoo does conservation work in a number of countries around the world, the future of wildlife in these places ultimately depends on local people. To encourage the creation of a new generation of African scientists, the zoo's Dr. Rich Bergl is helping supervise the Ph.D. studies of Nigerian biologist Inaoyom Imong. Imong is studying how the distribution of plants and patterns of human activity influence the presence and absence of the critically endangered Cross River gorilla. Imong's study will be useful for gorilla conservation, and his training will prepare him to be a future conservation leader in Nigeria.

Monitoring Forest Health for Conservation and Education

The forest health-monitoring project at the zoo is a collaboration between regional high schools and the North Carolina Zoological Park. This project provides meaningful hands-on experience with science and field research

in the Zoo's natural areas. Students from Asheboro High School, the Zoo School and Randolph County Early College participated in this project. Data collected by these students have guided the management of the Basic Mesic Forest and Purgatory Mountain. These sites are important due to their mature forests and the presence of rare plant species of special concern to the state of North Carolina. This collaboration provides a unique opportunity for environmental education in Randolph County and is a model for conservation research and the development of future conservationists.

Veterinary Internship and Residency Program

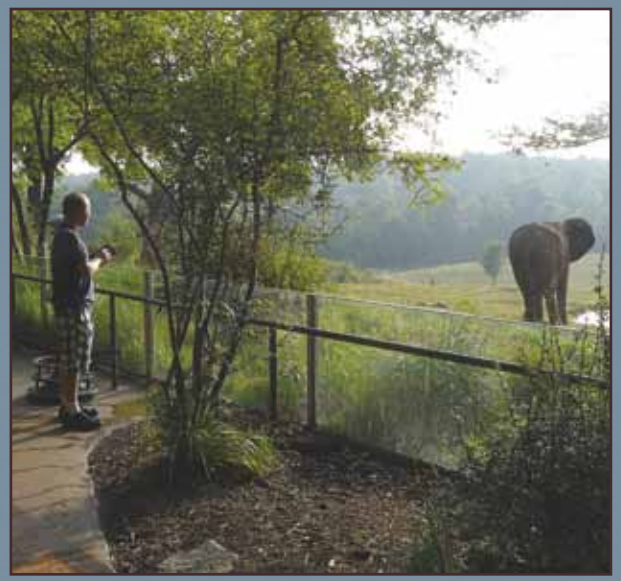
The North Carolina Zoo veterinary training program provides in-depth and hand on experience for interns and residents at the Hanes Veterinary Medical Center. Zoo vets Mike Loomis and Ryan DeVoe train interns and residents in all aspects of clinical zoological medicine. This competitive and well-regarded program has produced graduates that have gone on to work with wild mountain gorillas, obtain positions as professors of veterinary medicine, and become veterinarians at other zoos around the country.

Bringing Wildlife Research Into The Classroom

Field Trip Earth (FTE), at *fieldtripearth.org*, is a conservation education website that makes it possible for students and teachers to interact with field-based wildlife researchers at work around the world. Developed by the North Carolina Zoological Society, Field Trip Earth is a vehicle for sharing the products of field research — field diaries, photographs, video, datasets, maps, and so on — with classrooms and others interested in wildlife conservation. These "raw materials" are provided by more than 100 researchers who have written for the site, and are designed to be easily integrated into day-to-day teaching activities across all of the academic disciplines. For example, many teachers use researchers' field diaries to teach journaling and other literacy skills, while others use geographic location datasets generated by animal tracking projects to teach their students mapping concepts or coordinate systems. Field Trip Earth has been named one of the top 21 websites in the world for learning and curriculum development by the American Association of School Librarians!

Behavioral Research Internship through the State of North Carolina

One of the most important tasks facing any zoo is to provide its animals with an environment that promotes animal welfare. This is particularly true for elephants, which require large amounts of space and a variety of sources of mental stimulation. Following the renovation of the NC Zoo's elephant facility several years ago, we embarked on a research project to study how the elephants behaved in their new surroundings. Since such a study requires many hours of careful observation, we worked with the State of North Carolina Internship Program to create an opportunity for college students to learn how to do behavioral research while simultaneously gathering the data needed to better understand our elephants' behavior. Interns learn about elephant behavior and data collection, then spend the summer observing the elephants both on-exhibit and in their behind-the-scenes quarters.



North Carolina Zoo

Our Mission is to encourage understanding of and commitment to the conservation of the world's wildlife and wild places through the recognition of the interdependence of people and nature.

NORTH CAROLINA ZOOLOGICAL SOCIETY

The Mission of the North Carolina Zoological Society is to support the North Carolina Zoological Park in its missions of conservation, education, research, and recreation.





ACCREDITED BY THE ASSOCIATION OF ZOOS & AQUARIUMS NCDENR

The Zoo is an agency of the Department of Environment and Natural Resources, State of North Carolina. Beverly Eaves Perdue, Governor